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ABSTRACT

Developed as part of the ABCs of Construction National Workplace Literacy Project, this instructional module contains instructional materials designed to help students understand the concept of sequencing and develop basic sequencing skills. The module begins with a unit in which instructional materials dealing with the construction industry are used to teach the importance of sequencing skills. Presented next are three sections of exercises containing reading materials specific to one of the following occupations/occupational clusters: electrical and instrumentation, pipefitting, and millwright. Each section contains five exercises in which students are presented with a story or some job-related procedure and are then asked either to answer a series of questions about the sequencing involved in the story/procedure or to select the best sequencing sequence from a series of sequencing options. Also included are answer keys for each of the three sections of exercises. (MN)

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MODULES OF INSTRUCTION DEVELOPED IN GRANT CYCLE

1. Writing Frames for Construction Workers (10 exercises)

for low-level readers; consists of 10 "paragraphs" with open-ended sentences for workers to complete and recopy in their notebooks. Topics deal with work and training, such as "My Job," "Classroom Behavior," and "Listening to Myself."

2. Writing About Your Craft (10 topics)

for all students; list of 10 topics, such as "My Boss," "The Main Beef About My Job," and "How Work Orders Are Delivered." Used for integrating reading and writing in a job-specific context.

3. Building Workplace Vocabulary for E & I: Structural Analysis (80 pages)
Building Workplace Vocabulary for Millwrights: Structural Analysis(79 pages)
Building Workplace Vocabulary for Pipefitters: Structural Analysis(79 pages)

5th grade level; teaches word attack skills for technical terms, utilizing word parts and root words; includes hints for retaining meanings by building card file with visual representations of terminology.

4. Building Workplace Vocabulary for E & I: General, Specialized, & Technical Terms (58 pages)
Building Workplace Vocabulary for Millwrights: General, Specialized & Technical Terms (29 pages)
Building Workplace Vocabulary for Pipefitters: General, Specialized, & Technical Terms (32 pages)

5th grade level; teaches different kinds of vocabulary words encountered in work-related texts; drills for remembering new words; tips for building vocabulary; some dictionary use.

5. Building Workplace Vocabulary for E & I: Compound Words (28 pages)
Building Workplace Vocabulary for Pipefitters: Compound Words (18 pages)
Building Workplace Vocabulary for Millwrights: Compound Words (22 pages)

5th grade level; strategies for finding the meanings of compound words used in technical writing; works with words in context

6. Improving Listening Skills: Hazards Communication (18 pages)
Improving Listening Skills: Fire Extinguishers (22 pages)

a viewing, study guide that accompanies a commercial training video used in the required 8-hour OSHA safety course; learning new words, main ideas, and drawing conclusions are covered.

7. Measuring Decimals: Millwright (28 pages)

instruction and application problems

8. Improving Study Skills/Test Taking (60 pages)

6th grade level; good study skills are needed for success in the ABC Training program; explores strategies for organizing class notes and study time; analysis sheet for determining weaknesses in test preparation; how to schedule to arrange study time and work time

Computer Program

"Math for Pipefitters" is an interactive, multi-media program that covers fractions, decimals, angles, and right triangle geometry in a pipefitting context (88 screens)

UNDERSTANDING SEQUENCES: FOLLOWING DIRECTIONS IN CONSTUCTION MATERIALS

Objective: To read to follow directions.

It was Ted's first day at work. He had just finished school. He never had a "real" job before. He wasn't sure what to do. He asked his foreman. The foreman said, "Clock in. Unload the truck. Sort the pipe by size. Stack it. Then see me. I'll tell you what else to do."

Ted wanted to make a good impression. He began unloading the truck. He stacked all the pipe. He finished the job. He looked at the stacks. Something looked wrong. He thought back. What did the foreman say? Right! He was supposed to sort the pipe first. Ted quickly sorted the pipe. He then stacked it. It looked much better. Ted had worked hard. He worked hard for the rest of the day. He worked hard all week.

Ted's first week ended. He got his paycheck. He opened it. Wait a minute! Something was wrong. Ted thought his check would be bigger. He worked hard. What happened to his money?

Ted talked to the foreman. The foreman looked at the check. He was surprised. He knew Ted was a hard worker. He

knew Ted worked all week. Where was Ted's money? The foreman pulled Ted's timesheet.

On Monday, Ted clocked in at 9:15. On Tuesday and Wednesday, he clocked at 10:00. On Thursday, Ted clocked in at 10:30. He clocked in Friday after lunch.

The foreman talked to Ted. He said, "Ted, you're a good worker. You come to work on time. You work hard each day. You need to change one thing. Think back. Each day, I told you what to do. Each day, I told you to clock in first. You wanted to get busy. You didn't clock in first. It just doesn't work that way. You have to do first things first. When you do things is often as important as how you do it."

Ted's foreman is talking about following directions. This means you do things is a certain order. Some things must be done first. Others must come last. Following directions means you understand the steps in instructions. These form a sequence--a step-by-step process.

Sometimes you don't have a foreman to tell you what to do. You must read information for yourself to find what to do. This information directs you. It tells you what to do at each step. Following directions is itself a process in which you do things in a certain order.

Every sequence has a purpose. This is its point or main idea. The main idea is usually a change or outcome. The steps, then, lead you to where you need to go. The point could be a change in a raw material. It could be a way to use a tool. It could be a way to insure safety. Finding the point is an important part of following directions.

STEPS IN FOLLOWING DIRECTIONS

1. Some directions begin with a heading or label. Read this first. This title often tells you the sequence's main idea.

2. Read the directions through. This reading gives you an overall sense of what to do. It tells you how many steps to do. You can also get an idea of how hard each step will be. NOTE: The directions may not seem to make sense. That's OK. Many directions seem unclear after first reading.

3. Decide what you think the point of the sequence is.

4. Read Step 1. Do what it says.

5. Continue reading. Follow each step until you reach the last step.

6. Reread the directions to check your work.

How do you know what steps are in a sequence? Sometimes, finding the steps is easy. Some directions include words like "STEP 1" "STEP 2" and so on. Other directions are harder to follow. Some directions use words like "ONE" or "FIRST" to show you where to start. Some use words like "SECOND," "THIRD," "NEXT," "AND THEN," or "NOW" to show you what else to do. Words like "LAST" or "FINALLY" help you find the end of the directions.

EXAMPLE:

Procedure for Using a Combination Bench and Pipe Vise

WARNING! Follow all safety precautions!

Step 1 Inspect the vise for any defects that might make it unsafe to use.

Step 2 Turn the handle counterclockwise to open the jaws.

Step 3 Place the workpiece between the jaws.

Step 4 Tighten the jaws by turning the handle clockwise until the work piece is held between the jaws so that the material does not slip.

WARNING! If the work piece slips in the vise, it can cause damage to the material or present a safety hazard.

Wheels of Learning Trainee Guide, Task Module 12101, Instrumentation, Hand Tools for Instrumentation p. 15

1. Some directions begin with a heading or label. Read this first. It often tells you the sequence's main idea. The title of the sequence is "PROCEDURE FOR USING A COMBINATION BENCH AND PIPE VISE."

2. Read the directions through. This reading gives you an overall sense of what you must do. You can also get an idea of how hard each step will be. NOTE: The directions may not make sense. That's OK. Many directions seem unclear after first reading. The procedure has four steps. The steps don't appear too hard.

3. Decide what you think the sequence's point is. This process tells how to open the jaws of a vise and insert a piece of work securely so that you can work on it.

4. Read Step 1. Do what it says. Step 1 involves safety-- you check the vise for problems before use.

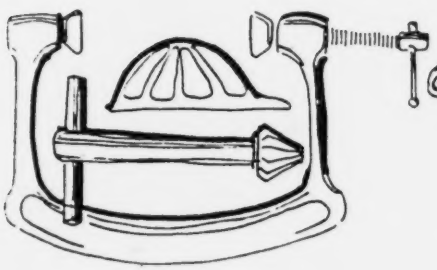
5. Continue reading. Follow each step until you reach the last step. Step 2 tells you how to open the jaws of the vise. You place the work into the jaws of the vise in Step 3. In Step 4, you tighten the jaws of the vise so that the work is secure.

6. Reread the directions to check your work. Check for defects first. Open the vise. Insert the work. Close the vise securely.

TECHNICAL DEVELOPMENT CENTER

EXERCISES

Electrical and Instrumentation



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Exercise 1

Jack used an electric percussion hammer to drill through some concrete. He reads the following from his Craft Training Handbook.

PROCEDURE FOR USING AN ELECTRIC PERCUSSION HAMMER

Before using an electric percussion hammer, know its applications and limitations. These can be found in the manufacturer's instructions. Electric percussion hammers can be used with drill bits, chisels, or other attachments. This procedure uses a drill bit.

WARNING! Follow all safety precautions.
Step 1 Select the correct drill bit for the job.

Step 2 Insert the drill bit in the chuck.

NOTE: If using a star drill, insert the chuck and handle assembly, lock it in place, and then insert the bit.

WARNING! Check that the bit is secure in the chuck. A loose bit can cause personal injury or damage to the work.

Step 3 Position the hammer at the angle desired for the hold. Position the bit firmly on the center mark.

NOTE: Pull the trigger only after the bit is in position and firm pressure has been applied. The pressure holds the bit in place and prevents it from wandering. Never allow an electric hammer to idle. If there is no pressure being applied to the bit, the force of the reciprocating action of the bit is absorbed by the nose bushing. This can seriously damage the nose bushing.

Step 4 Squeeze the trigger, being sure to hold the hammer securely and straight while drilling to avoid jamming or binding the bit.

NOTE: Should the bit seize in the hole, reversing direction of the bit or using a rotating motion may loosen it.

Step 5 When finished drilling the hole, clean chips and debris out of hole with a squeeze bulb.

Warning: Do not use an air hose to clean out the hole.

Wheels of Learning Trainee Guide, Task Module 12103, Instrumentation, Power Tool for Instrumentation p. 13-14

Which of the following best describes what Jack should have done?

OPTION A

Jack chose a drill bit. He inserted the drill bit in the chuck. He checked the hole. He cleaned chips and debris from the hole with an air hose. He squeezed the trigger. He held the hammer securely and straight. This kept the drill from jamming or binding the bit. He positioned the hammer at the angle desired for the hole. He positioned the bit firmly on the center mark.

OPTION B

Jack chose the right drill bit for the job. He put the drill bit in the chuck. Jack held the hammer at the angle he needed. He carefully positioned the bit on the center mark. He squeezed the trigger. He kept the hammer from jamming by holding the hammer securely. He drilled the hole and cleaned it with a squeeze bulb.

OPTION C

Jack chose a drill bit. He inserted the drill bit in the chuck. He squeezed the trigger. He checked the hole. He cleaned chips and debris from the hole with an air hose He positioned the hammer at the angle desired for the hole. He positioned the bit firmly on the center mark. He held the hammer securely and straight. This kept the drill from jamming or binding the bit.

EXERCISE 2

Jan is installing threaded fasteners. She is using a torque wrench to tighten the nuts. She reads the following in her ABC Craft Training handbook.

INSTALLING THREADED FASTENERS

The following general procedure can be used to install threaded fasteners in a variety of applications:

NOTE: When installing threaded fasteners for a specific job, make sure to check all installation requirements.

WARNING: Follow all safety precautions.

Step 1 Select the proper bolts or screws for the job.

Step 2 Check for damaged or dirty internal and external threads.

Step 3 Clean the bolt or screw threads. Do not lubricate the threads if a torque wrench is to be used to tighten the nuts.

Step 4 Insert the bolts through the pre-drilled holes and tighten the nuts by hand. Or, insert the screws through the holes and start the threads by hand.

NOTE: Turn the nuts or screws several turns by hand and check for cross threading.

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Step 5 Following the proper tightening sequence, tighten the bolts or screws snug.

Step 6 Check the torque specification. Following the proper tightening sequence, tighten each bolt, nut, or screw several times approaching the specified torque. Tighten to the final torque specification.

Step 7 If required to keep the bolts or nuts from working loose, install jam nuts, cotter pins, or safety wire.

Wheels of Learning Trainee Guide, Task Module 12106, Instrumentation, Instrumentation Fasteners , p. 34.

Which of the following best describes what Jan should do?

OPTION A

Jan should choose the bolts she needs. She should then clean each one. She must check for damaged internal and external threads. She needs to carefully lubricate the threads. She should install jam nuts to keep the bolts from working loose. She will then insert the bolts through the pre-drilled holes. She should tighten the nuts by hand. She will tighten the bolts snug by following the proper tightening sequence. She will then check the torque specification. She must tighten each bolt several times to approach the desired torque. Lastly, she will tighten the bolts to the final torque specifications.

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OPTION B

Jan should choose the bolts she needs. She must check for damaged internal and external threads. She should then clean each one. She needs to carefully lubricate the threads. She will then insert the bolts through the pre-drilled holes. She should install jam nuts to keep the bolts from working loose. She should tighten the nuts by hand. She will tighten the bolts snug by following the proper tightening sequence. She will then check the torque specification. She must tighten each bolt several times to approach the desired torque. Lastly, she will tighten the bolts to the final torque specifications.

OPTION C

Jan should choose the bolts she needs. She must check for damaged internal and external threads. She should then clean each one. She should not lubricate the threads because she is using a torque wrench. She will then insert the bolts through the pre-drilled holes. She should tighten the nuts by hand. She will tighten the bolts snug by following the proper tightening sequence. She will then check the torque specification. She must tighten each bolt several times to approach the desired torque. Lastly, she will tighten the bolts to the final torque specifications. She should install jam nuts to keep the bolts from working loose.

EXERCISE 3

Vu is going to install blind rivets through drilled holes with a pop rivet tool. He reads the following information in his ABC Craft Training handbook.

INSTALLING BLIND RIVETS

Blind rivets are installed through drilled or punched holes with a special blind (pop) rivet tool. Use the following general procedure to install blind rivets:

WARNING: Follow all safety precautions.

WARNING: Make sure to wear proper eye and face protection when riveting.

Step 1 Select the correct length and diameter of blind rivet to be used.

Step 2 Select the appropriate drill bit for the size of rivet being used.

Step 3 Drill a hole through both parts being connected.

Step 4 Inspect the rivet gun for any defects that might make it unsafe for use.

Step 5 Place the rivet mandrel into the proper sized setting tool.

Step 6 Insert the rivet end into the pre-drilled hole.

Step 7 Install the rivet by squeezing the handle of the rivet gun causing the jaws in the setting tool to grip the mandrel. The mandrel is pulled up, expanding the rivet until it breaks at the shear point.

Step 8 Inspect the rivet to make sure the pieces are firmly riveted together and that the rivet is properly installed.

Wheels of Learning Trainee Guide, Task Module 12106, Instrumentation, Instrumentation Fasteners p. 35-36.

Which of the following best describes what Vu did?

OPTION A

First, Vu put on a protective face mask. He then selected the correct length and diameter of the blind rivet he needed. He chose the appropriate drill bit for the size of rivet being used. He drilled a hole through both parts being connected. He placed the rivet mandrel into the proper-sized setting tool. He inspected the rivet gun for defects. He inserted the rivet end into the pre-drilled hole. He installed the rivet by squeezing the handle of the rivet gun. Vu inspected the rivet to be sure the pieces were firmly riveted together.

OPTION B

First, Vu put on a protective face mask. He then selected the correct length and diameter of the blind rivet he needed. He chose the appropriate drill bit for the size of rivet being used. He drilled a hole through both parts being connected. He inspected the rivet gun for defects. He placed the rivet mandrel into the proper-sized setting tool. He inserted the rivet end into the pre-drilled hole. He installed the rivet by squeezing the handle of the rivet gun. Vu inspected the rivet to be sure the pieces were firmly riveted together.

OPTION C

First, Vu put on a protective face mask. He chose the appropriate drill bit for the size of rivet being used. He drilled a hole through both parts being connected. He then selected the correct length and diameter of the blind rivet he needed. He placed the rivet mandrel into the proper-sized setting tool. He inspected the rivet gun for defects. He inserted the rivet end into the pre-drilled hole. He installed the rivet by squeezing the handle of the rivet gun. Vu inspected the rivet to be sure the pieces were firmly riveted together.

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EXERCISE 4

G.J. is using toggle bolts to fasten a mount to wallboard. He reviews the following information from his ABC manual.

INSTALLING TOGGLE BOLTS

Toggle bolts are used to fasten a part to hollow block, wallboard, plaster, panel, or tile. The following general procedure can be used to install toggle bolts.

WARNING! Follow all safety precautions.

Step 1 Select the proper size of drill bit or punch and toggle bolt for the job.

Step 2 Check the toggle bolt for damaged or dirty threads or a malfunctioning wing mechanism.

Step 3 Clean and lightly lubricate the threads of the bolt.

Step 4 Using the correct size of drill bit, drill a hole completely through the surface to which the part is to be fastened.

Step 5 Insert the toggle bolt through the opening in the item to be fastened.

Step 6 Screw the toggle wing onto the end of the toggle bolt, ensuring that the flat size of the toggle wing is facing the bolt head.

Step 7 Fold the wings completely back and push them through the drilled hole until the wings spring open.

Step 8 Tighten the toggle bolt with a screwdriver until it is snug.

Wheels of Learning Trainee Guide, Task Module 12106, Instrumentation, Instrumentation Fasteners p. 37

Which of the following best describes what G.J. should have done?

OPTION A

G.J. looked at the mount. He chose a toggle bolt that was the proper size for the job. He picked a drill bit to match it. He checked the bolt to make sure it was clean. He looked to see that the wing mechanism was working. He cleaned the threads on the bolt. He oiled them. He drilled a hole through the wallboard. He put the bolt through the hole in the mount. He screwed the toggle wing on the end of the toggle bolt. He made sure that the flat side of the wing faced the bolt head. He folded the wings back. He pushed the wings through the hole. He let the wings spring open. He pulled the mount back to hold the wings against the inside of the wallboard. He tightened the toggle with a screwdriver until snug.

OPTION B

G.J. looked at the mount. He drilled a hole through the wallboard. He chose a toggle bolt that was the proper size for the job. He cleaned the threads on the bolt. He oiled them. He picked a drill bit to match it. He checked the bolt to make sure it was clean. He looked to see that the wing mechanism was working. He put the bolt through the hole in the mount. He screwed the toggle wing on the end of the toggle bolt. He made sure that the flat side of the wing faced the bolt head. He folded the wings back. He pushed the wings through the hole. He let the wings spring open. He pulled the mount back to hold the wings against the inside of the wallboard. He tightened the toggle with a screwdriver until snug.

OPTION C

G.J. looked at the mount. He drilled a hole through the wallboard. He put the bolt through the hole in the mount. He chose a toggle bolt that was the proper size for the job. He picked a drill bit to match it. He checked the bolt to make sure it was clean. He looked to see that the wing mechanism was working. He cleaned the threads on the bolt. He oiled them. He screwed the toggle wing on the end of the toggle bolt. He made sure that the flat side of the wing faced the bolt head. He folded the wings back. He pushed the wings through the hole. He let the wings spring open. He pulled the mount back to hold the wings against the inside of the wallboard. He tightened the toggle with a screwdriver until snug.

EXERCISE 5

Loyd replaced a gasket on a flange. He had to layout a new one. He used the following information from his ABC training guide:

LAYING OUT NEW GASKET
The following procedure describes how to lay out and cut a new gasket for a pipe flange.

WARNING! Follow all safety precautions.

Step 1 Select the proper gasket material for the conditions and process.

Step 2 Take three measurements (draw each as concentric circles):
* diameter of pipe opening,
* outside diameter of flange, and
* diameter of the bolt hole circle.
The diameter of the bolt circle is found by measuring from the bottom (or top) of opposite holes.

Step 3 Find the radius of the bolt circle. The radius of the bolt circle is equal to half of the diameter.

Step 4 Draw a line through the circle's center for opposite holes.

Step 5 On a 6-hole flange, the radius is equal to the distance between bolt holes.

Step 6 To check the distance, walk the dividers around the circle.

NOTE: Lay out holes a little larger than their actual size. Gaskets with an even number of holes (i.e., 4, 8, 16) can also be laid out using the "swing arc" method. This method uses the divider to bisect distances. Flanges with an odd number of holes can be laid out using a protractor (simply divide 360 degrees by the number of holes) or by using the mathematical method.

Step 7 Cut out the gasket using a gasket cutter.

NOTE: The blade should not protrude more than 1/32" more than the thickness of the gasket material. Never hammer the gasket, as hammering may cause lumps in the gasket.

Step 8 Place the gasket material on hard wood to protect the punch edge. Then, punch out the holes using a hole punch.

Wheels of Learning. Instrumentation Module 12108 Gaskets and Packing, p. 10-12.

Loyd's foreman is checking his work. Which of the following will get an "OK" from the foreman?

OPTION A

Loyd chose a material suitable for the conditions and process. He drew a line through the center of the circle for opposite holes. Since he was cutting a 6-hole flange, he found the radius was equal to the distance between the bolt holes. He walked the dividers around the hole to check his work. He measured the diameter of the pipe opening. He measured the outside diameter of the flange. He measured the diameter of the bolt hole circle. He figured the radius of the bolt circle. He used a gasket cutter to cut the gasket. He placed the gasket material on hard wood to protect the punch edge. He punched out the holes.

OPTION B

Loyd chose a material suitable for the conditions and process. He measured the diameter of the pipe opening. He measured the outside diameter of the flange. He measured the diameter of the bolt hole circle. He figured the radius of the bolt circle. Since he was cutting a 6-hole flange, he found the radius was equal to the distance between the bolt holes. He walked the dividers around the hole to check his work. He used a gasket cutter to cut the gasket. He drew a line through the center of the circle for opposite holes. He punched out the holes. He placed the gasket material on hard wood to protect the punch edge.

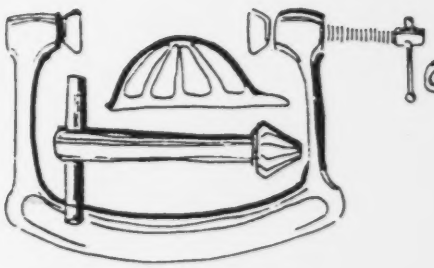
OPTION C

Loyd chose a material suitable for the conditions and process. He measured the diameter of the pipe opening. He measured the outside diameter of the flange. He measured the diameter of the bolt hole circle. He figured the radius of the bolt circle. He drew a line through the center of the circle for opposite holes. Since he was cutting a 6-hole flange, he found the radius was equal to the distance between the bolt holes. He walked the dividers around the hole to check his work. He used a gasket cutter to cut the gasket. He placed the gasket material on hard wood to protect the punch edge. He punched out the holes.

TECHNICAL DEVELOPMENT CENTER

EXERCISES

Pipefitting



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Exercise 1

Carl used a manual bender--a hickey--to bend pipe before installing. He was supposed to use the following steps from his ABC Craft Handbook:

Step 1 Determine the size of the pipe to be bent.

Step 2 Select the proper size of bender.

Step 3 Mark the pipe at the beginning of the bend.

Step 4 Lay the pipe on the floor.

Step 5 Slide the bender onto the pipe at the start of the bend.

Step 6 Grip the handle, and pull the bender down toward the floor to make the bend.

NOTE: The thin-wall conduit bender will make a smooth bend with one long pull of the handle; it has a heel that you can press with your foot to assist in bending the pipe. The pipe and heavy-wall conduit bender requires you to make a small bend, slide the bender along the pipe a short distance, and make another bend until the proper bend in achieved.

Step 7 Stop the bend when the required bend angle is achieved.

CAUTION Be careful not to bend the pipe past the required angle. It is difficult to straighten pipe without damaging it.

Step 8 Remove the bender from the pipe.

Step 9 Check the pipe for cracking or kinking.

Step 10 Store the bender it its proper place.

Wheels of Learning Trainee Guide, Task Module 08101, Pipefitter Hand Tools, p. 68-69

Using this process, Carl correctly bent the pipe. Which of the following did Carl probably do?

OPTION A

Carl measured the pipe. It was 1/2 inch pipe. He chose the right bender size. He found where the beginning of the pipe should be and marked the pipe. He put the pipe on the floor. He slid the bender on the pipe at the start of the bend. Carl carefully gripped the handle. He pulled the bender down toward the floor to make the bend. He stopped when the bend reached the correct angle. He removed the hickey. He looked at the pipe to see if it was cracked or kinked. He put the bender away.

OPTION B

Carl chose the right bender size and measured the pipe. It was 1/2 inch pipe. He found where the beginning of the pipe should be and marked the pipe. He put the pipe on the floor. He slid the bender on the pipe at the start of the bend. Carl carefully gripped the handle. He pulled the bender up away from the floor to make the bend. He stopped when the bend reached the correct angle. He looked at the pipe to see if it was cracked or kinked. He removed the hickey. He put the bender away.

OPTION C

Carl chose the right bender size and measured the pipe. It was 1/2 inch pipe. He marked the pipe. He found where the beginning of the pipe should be. He put the pipe on the floor. Carl carefully gripped the handle of the hickey. He slid the bender on the pipe at the start of the bend. He pulled the bender up away from the floor to make the bend. He stopped when the bend reached the correct angle. He looked at the pipe to see if it was cracked or kinked. He removed the hickey. He put the bender away.

Exercise 2

Jay has been cutting steel pipe with a portable band saw. The blade has become worn. He needs to replace it. He knows that this requires the following method:

WARNING! Make sure the portable band saw is unplugged before replacing the blade.

Step 1 Rotate the blade adjust knob 180 degrees to release the tension on the blade.

Step 2 Turn the saw upside down on your work table.

Step 3 Remove the blade from the blade pulleys underneath the saw.

WARNING! Be careful when removing the blade, because the blade has a tendency to spring out when you take it off the blade pulleys.

Step 4 Slip a new blade around the blade pulleys.

Step 5 Slip the new blade into the blade guide and the back stop.

Step 6 Turn the saw over, and rotate the blade adjust knob to put tension on the blade.

Wheels of Learning Trainee Guide, Task Module 08102, Pfeiffer Power Tools, p. 9-10

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Jay had some problems changing the blade in the saw. What should Jay do to correctly replace the saw blade?

OPTION A

Jay should should rotate the blade adjust knob a quarter-turn. This will increase tension on the blade. He should hold the saw rightside up. He should take the blade from the blade pulleys on the top of the saw. He should then slip the blade around the blade pulleys. He should then slip the new blade into the blade guide. The new blade should slip into the back stop. Jay should turn the saw over and rotate the blade adjust knob to release tension on the blade.

OPTION B

Jay should unplug the saw first. He should rotate the blade adjust knob a full turn. This will increase tension on the blade. He should hold the saw upside down. He should take the blade from the blade pulleys underneath the saw. He should then slip the blade over the blade pulleys. He should then slip the new blade into the blade guide. The new blade should slip into the back stop. Jay should turn the saw over and rotate the blade adjust knob to release tension on the blade.

OPTION C

Jay should unplug the saw first. He should rotate the blade adjust knob a half-turn. This will release tension on the blade. He should hold the saw upside down. He should take the blade from the blade pulleys underneath the saw. He should then slip the blade around the blade pulleys. He should then slip the new blade into the blade guide. The new blade should slip into the back stop. Jay should turn the saw over and rotate the blade adjust knob to regain tension on the blade.

Exercise 3

Vic is a new employee. He will be using a portable pneumatic grinder. His supervisor gives him the following information so Vic can inspect the grinder before use.

Step 1 Inspect the air inlet and the air line of a pheumatic grinder to ensure there are no signs of damage that could cause a bad connection or loss of air.

Step 2 Inspect the power cord and plug in electric models to ensure there are no signs of damage.

Step 3 Inspect the handle to make sure it is not loose, which could cause a loss of control.

Step 4 Inspect the grinder housing and body for defects.

Step 5 Ensure that the trigger switch works properly and does not stick in the ON position.

Step 6 Ensure that the safety guard is in good condition and securely attached to the grinder.

Step 7 Check the oil level in pneumatic grinders.

Step 8 Ensure that the maximum rotating speed of the grinding wheel is higher than the maximum rotating speed of the grinder.

Step 9 Start the grinder, and allow it to run for 1 to 2 minutes while checking for visual abnormalities, excessive vibration, extreme temperature changes, or noisy operation.

Step 10 Inspect the work area to ensure the safety of yourself and others and to make sure that the heat and sparks generated by the grinder cannot start any fires.

Wheels of Learning Trainee Guide, Task Module 08102, Pipefitter Power Tools, p 9-10

Which of the following will get an OK from Vic's supervisor?

OPTION A

Vic checked the air intake and air line. He checked for other signs of damage that would result in a loss of air. He checked the grinder's handle, housing, and body. He made sure that the trigger was working properly. He examined the safety guard and made sure it was attached to the grinder. He checked the oil level. He made sure that the maximum rotating speed of the grinding wheel was higher that the maximum rotating speed of the grinder. He started the grinder. He let it run for a couple of minutes. He looked at the grinder to see if he saw anything wrong. He felt to see if it vibrated too much or got too hot. He listened to see if the grinder ran more loudly than usual. Vic checked the work area. He saw some papers that could catch on fire. He put the papers away.

OPTION B

Vic checked the grinder's handle, housing, and body. He made sure that the trigger was working properly. He examined the safety guard and made sure it was attached to the grinder. Vic checked the air intake and air line. He checked for other signs of damage that would result in a loss of air. He checked the oil level. He made sure that the maximum rotating speed of the grinding wheel was higher that the maximum rotating speed of the grinder. He started the grinder. He let it run for a couple of minutes. He looked at the grinder to see if he saw anything wrong. He felt to see if it vibrated too much or got too hot. He listened to see if the grinder ran more loudly than usual. Vic checked the work area. He saw some papers that could catch on fire. He put the papers away.

OPTION C

Vic started the grinder. He let it run for a couple of minutes. He looked at the grinder to see if he saw anything wrong. He felt to see if it vibrated too much or got too hot. He listened to see if the grinder ran more loudly than usual. Vic checked the air intake and air line. He checked for other signs of damage that would result in a loss of air. He checked the grinder's handle, housing, and body. He made sure that the trigger was working properly. He examined the safety guard and made sure it was attached to the grinder. He checked the oil level. He made sure that the maximum rotating speed of the grinding wheel was higher that the maximum rotating speed of the grinder. Vic checked the work area. He saw some papers that could catch on fire. He put the papers away.

Exercise 4

Zach must make sure a joint in 5/8 inch pipe is leakproof. He will be using Teflon tape. He reviews the following from his ABC craft training manual:

Warning! Never use Teflon tape on pipe that is to be welded or pipe that carries steam or other high-temperature service. When Teflon tape is heated, it emits a highly toxic gas that could be fatal.

Step 1 Remove all excess cutting oil from the threads to improve the grip of the tape on the threads.

NOTE: Use 1/2 inch wide Teflon tape for pipe that is 3/4 inch nominal size and smaller. Use 3/4 inch wide tape for pipe that is 1-inch nominal size or larger.

Step 2 Start the tape from the end of the pipe, leaving the first full thread bare to prevent the tape from bunching up at the beginning of the thread.

Step 3 Wrap the tape around the pipe in the direction that the joint is to be assembled.

NOTE: Tape should be wrapped around right-hand threads in a clockwise direction and around left-hand threads in a counterclockwise direction.

Step 4 Continue to wrap the tape around the joint, overlapping the edges of each wrap until all remaining threads have been covered.

Step 5 Press the tape against the threads to seal it to the threads and prevent the tape from slipping off the threads once you start to make up the joint.

What is the proper way for Zach to wrap the pipe with Teflon tape?

OPTION A

Zach used a cloth to remove the cutting oil from the threads of the pipe. He got a roll of 1 inch Teflon tape. He started taping from the middle of the pipe. He left the first full thread bare. He didn't want it to bunch in the middle of the pipe. He wrapped it clockwise because he used right-hand threads. He wrapped the pipe. He overlapped the edges until he could no longer see any threads. He smoothed the tape against the threads to seal it. He knew this would also prevent it from slipping when he made up the joint.

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OPTION B

Zach used a cloth to remove the cutting oil from the threads of the pipe. He got a roll of 1/2 inch Teflon tape. He started taping from the end of the pipe. He left the first full thread bare. He didn't want it to bunch at the end of the thread. He wrapped it clockwise because he used right-hand threads. He wrapped the pipe. He overlapped the edges until he could no longer see any threads. He smoothed the tape against the threads to seal it. He knew this would also prevent it from slipping when he made up the joint.

OPTION C

Zach used a cloth to remove the cutting oil from the threads of the pipe. He got a roll of 1 inch Teflon tape. He started taping from the end of the pipe. He didn't want it to bunch at the end of the thread. He wrapped it counterclockwise because he used right-hand threads. He wrapped the pipe. He overlapped the edges until he could no longer see any threads. He smoothed the tape against the threads to seal it. He knew this would also prevent it from slipping when he made up the joint.

Exercise 5

Lee's company got a contract to replace a piping system. She will be fitting screwed pipe and fittings. Lee knows she must use the following procedure:

Step 1 Determine the type, size, and schedule of pipe being used in the system.

Step 2 Determine the length of pipe needed.

Step 3 Cut the pipe to the desired length.

Step 4 Ream the pipe to remove all internal burrs.

Step 5 Thread the pipe, taking caution not to cut the threads too deep.

Step 6 Select the proper size, shape, and type of fittings needed.

Step 7 Clean the pipe and fittings thoroughly inside and out.

NOTE: All sand, dirt, and oil must be removed from the inside of the pipe and fittings to avoid contaminating the system or clogging the line. The fittings and pipe ends may be cleaned with a clean rag soaked in nonflammable solvent.

Step 8 Check the threads on the pipe and the fitting to ensure that they are properly cut and not damaged.

Step 9 Apply joint compound or Teflon tape to the pipe threads.

Step 10. Start the fitting on the pipe by hand.

Step 11. Tighten the fitting slowly, using a pipe wrench.

CAUTION: Tightening the fitting quickly causes excessive heat due to friction, which could cause the threads or the fitting to expand. Do not allow the threads to bottom out into the fitting. This can damage the threads and the fitting.

Wheels of Learning Trainee Guide, Task Module 08103, Pipefitting, Threaded Pipe Fabrication p. 45-46

If Lee did the job correctly, what did she do?

OPTION A

Lee checked the system. She measured the section that needed replacing. It was 24 inches long. She cut a new piece of schedule 40 carbon steel 2 inch pipe. She needed to remove some external burrs, so she reamed it. She carefully threaded the pipe. She selected a fitting based on the size, shape, and type. She got a rag and some flammable solvent. She cleaned the pipe and the fitting inside and outside. Lee checked the pipe's threads to make sure she had cut them accurately. She put joint compound on the threads. She started fitting the pipe by hand. Lee used a pipe wrench to slowly tighten the fitting. She made sure that the threads did not bottom out into the fitting.

OPTION B

Lee checked the system. She noted that the pipes were schedule 40 carbon steel 2 inch pipe. She measured the section that needed replacing. It was 24 inches long. She cut a new piece of schedule 40 carbon steel 2 inch pipe. She needed to remove some internal burrs, so she reamed it. She carefully threaded the pipe. She selected a fitting based on the size, shape, and type. She got a rag and some nonflammable solvent. She cleaned the pipe and the fitting inside and outside. Lee checked the pipe's threads to make sure she had cut them accurately. She put joint compound on the threads. She started fitting the pipe by hand. Lee used a pipe wrench to slowly tighten the fitting. She made sure that the threads did not bottom out into the fitting.

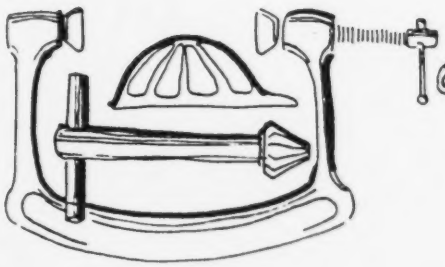
OPTION C

Lee checked the system. She measured the section that needed replacing. It was 24 inches long. She selected a fitting based on the size, shape, and type she needed. She noted that the pipes were schedule 40 carbon steel 2 inch pipe. She cut a new piece of schedule 40 carbon steel 2 inch pipe. She needed to remove some internal burrs, so she reamed it. She carefully threaded the pipe. She got a rag and some nonflammable solvent. She cleaned the pipe and the fitting inside and outside. Lee checked the pipe's threads to make sure she had cut them accurately. She put joint compound on the pipe being careful not to get any on the threads. Lee used a pipe wrench to slowly begin fitting the pipe. She made sure that the threads did not bottom out into the fitting. She tightened the fittings by hand.

TECHNICAL DEVELOPMENT CENTER

EXERCISES

Millwright



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EBR Adult & Continuing Education

Exercise 1

Gabe is installing gaskets. He uses a putty knife to scrape off the old gaskets. He used the following steps to select, inspect, use and maintain the putty knife.

Step 1 Select a putty knife of the proper length and width to do the job.

WARNING! Do not choose a knife that is larger than needed and cannot be handled safely.

Step 2 Inspect the putty knife to ensure that the blade is not bent or dull and that the handle is in good condition and firmly attached to the blade.

Step 3 Hold the knife in one hand at an angle to the work, and scrape the gasket off using smooth, even strokes.

WARNING! Do not try to chip the gasket with the putty knife. This could nick the surface being scraped and dull the knife. Keep the knife blade flat on the surface. Do not try to scrape the side edge of the blade. Keep your hands away from the cutting edge of the blade, and work away from your body to prevent personal injury.

Step 4 Continue to scrape the surface until all the gasket is removed.

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Step 5 Clean the knife thoroughly with a rag, using solvent if needed.

Step 6 Oil the knife lightly to prefent rust.

Step 7 Store the knife in its proper place.

Wheels of Learning, Millwright Module 15101, Millwright Hand Tools, p 17.

What is the proper procedure for Gabe to use?

OPTION A

Gabe checked the gasket. He chose a putty knife that was appropriate in length and width. He looked at the blade to be sure it wasn't bent or dull. He looked at the handle to be sure it was in good condition and firmly attached to the blade. He held the knife in both hands. He made sure that he never held it at an angle to the gasket. He used short, choppy strokes to remove the gasket. He kept the blade flat on the surface. He made sure that he did not use the blade edge as a scraper. He kept his hands away from the cutting edge. He was careful to cut toward his body. Gabe kept scraping until all the gasket was removed. He carefully cleaned the knife and oiled it. He put the putty knife away.

OPTION B

Gabe checked the gasket. He chose a putty knife that was appropriate in weight. He looked at the blade to be sure it wasn't too sharp for the gasket. He looked at the handle to be sure it was in good condition and firmly attached to the blade. He held the knife in one hand. He made sure that he held it at an angle to the gasket. He used smooth, even strokes to remove the gasket. He kept the blade vertical on the surface. He made sure that he did not use the side edge as a scraper. He kept his hands away from the cutting edge. He was careful to cut away from his body. Gabe kept scraping until all the gasket was removed. He carefully oiled the knife. He put the putty knife away.

OPTION C

Gabe checked the gasket. He chose a putty knife that was appropriate in length and width. He looked at the blade to be sure it wasn't bent or dull. He looked at the handle to be sure it was in good condition and firmly attached to the blade. He held the knife in one hand. He made sure that he held it at an angle to the gasket. He used smooth, even strokes to remove the gasket. He kept the blade flat on the surface. He made sure that he did not use the side edge as a scraper. He kept his hands away from the cutting edge. He was careful to cut away from his body. Gabe kept

scraping until all the gasket was removed. He carefully cleaned the knife and oiled it. He put the putty knife away.

Exercise 2

Karl is connecting flanges and structural steel. He aligns bolt holes with drift pins. He uses the following steps to select, inspect, use, and maintain the pins.

Step 1 Select a pin of the proper size for the holes being aligned.

NOTE: The proper size drift pin will fit all the way through both holes being aligned and still be large enough and strong enough to pull the mating pieces together.

Step 2 Inspect the pin to ensure that it is not bent and that it does not have burrs that could cut your hands.

Step 3 Insert the pin into the holes of the mating pieces, and use it to pull the holes into alignment.

Step 4 Clamp the mating pieces together using a C-clamp, if possible, to hold the parts in alignment while the pin is removed and a bolt installed in its place.

NOTE: On pieces with more than one hole, the drift pin can be left in until bolts can be installed in the other holes. Then the drift pin is removed, and a bolt is installed in its place.

Step 5 Clean the pin, using a rag and solvent if needed.

Step 6 Cover the pin with a light coat of oil to prevent rust.

Step 7 Store the pin in its proper place.

Wheels of Learning, Millwright Module 15101, Millwright Hand Tools p. 16.

What would have been the best way for Karl to use a drift pin?

OPTION A

Karl measured the size of the holes he needed to align. He chose a pin to match. He checked the pin to see that it was not bent. He made sure there was nothing sharp that might cut his hands. He put the pin into the holes of the mating piece. He used that to pull the holes into the correct position. He got a C-clamp. He used that to put the mating pieces together. He removed the pin and installed a bolt in its place. Some dirt got on the pin. He cleaned it with a rag and solvent. He coated with pin with oil. He put the pin back.

OPTION B

Karl measured the size of the holes he needed to align. He chose a pin to match. He checked the pin tc see that it was not bent. He made sure there was nothing sharp that might cut his hands. He made sure that he did not put the pin into the holes of the mating piece. He pulled the holes into the correct position. He got a C-clamp. He used that to put the mating pieces together. He removed the pin and installed a bolt in its place. Some dirt got on the pin. He cleaned it with a rag and oil. He coated with pin with solvent to prevent rust. He put the pin back.

OPTION C

Karl chose a pin. He got a C-clamp. He checked the pin to see that it was not bent. He made sure there was nothing sharp that might cut his hands. Karl measured the size of the holes he needed to align. He used the pin to pull the holes into the correct position. He used the C-clamp to put the mating pieces together. He removed the pin and installed a bolt in its place. Some dirt got on the pin. He cleaned it with a rag and solvent. He coated with pin with oil. He put the pin back.

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Exercise 3

Jon must install some new gears. The gears he is replacing are precision gears which were press-fitted in place. He finds a couple of them particularly difficult to remove. Jon doesn't want to damage the gear, so he decided to get a gear puller. He uses the following process to select, inspect, use, and maintain a gear puller.

Step 1 Select a gear puller with the correct jaw length and spread width for the gear or bearing being pulled.

Step 2 Inspect the puller to ensure that the jaws are not bent or excessively worn and that the pressure bolt threads are not stripped.

Step 3 Ensure that all set screws or locking screws have been loosened or removed from the gear or bearing.

Step 4 Inspect the shaft to ensure that there are no nicks, burrs, or foreign objects that would interfere with the gear or bearing sliding off the shaft.

Step 5 Position the puller on the gear or bearing, and screw the pressure screw in until it presses against the shaft.

Step 6 Check the puller to ensure that the jaws are properly positioned on the gear or bearing.

CAUTION: The puller jaws must be positioned so that they will provide a straight, even pull on the gear or bearing and not damage it.

Step 7 Turn the pressure bolt slowly clockwise to begin applying pressure to the gear or bearing.

WARNING! Always wear eye protection when using a puller, because particles could break off and injure your eyes.

Step 8 Continue to tighten the pressure bolts until the gear or bearing is removed from the shaft.

Step 9 Clean the puller thoroughly.

Step 10 Coat the puller lightly with oil to prevent rust.

Step 11 Store the puller in its proper place.

Wheels of Learning, Millwright Module 15101, Millwright Hand Tools, p. 34-35.

What is NOT the correct way for Jon to use the gear puller?

OPTION A

Jon looked at the gear he needed to pull. He chose a gear puller with the correct jaw length and spread width. He checked the puller. He wanted to see if it was bent or worn. He needed to know if the bolt threads were stripped. He made sure that the set screw was loosened and removed from the gear. He checked the shaft. He made sure there were no foreign objects that would keep the gear from sliding off the shaft. He put the puller on the gear. He screwed the pressure screw in place until it touched the shaft. He checked the puller again to be sure it was properly positioned. He knew he needed to be able to evenly pull the gear straight out. He turned the pressure bolt slowly clockwise. This applied pressure to the gear. He put goggles on. He continued to tighten the pressure bolt until he removed the gear from the shaft. He cleaned the puller, oiled it, and put it away.

OPTION B

Jon looked at the gear he needed to pull. He chose a gear puller with the correct jaw length and spread width. He checked the puller. He wanted to see if there was anything wrong with it. He needed to know if the bolt threads were stripped. He put goggles on. He loosened the set screw and removed it from the gear. He checked the shaft. He made sure there were no nicks or burrs that would keep the gear from sliding off the shaft. He put the puller on the gear. He screwed the pressure screw in place until it touched the shaft. He checked the puller again to be sure it was properly positioned. He knew he needed to be able to evenly pull the gear straight out. He turned the pressure bolt slowly clockwise. This applied pressure to the gear. He continued to tighten the pressure bolt until he removed the gear from the shaft. He cleaned the puller. He oiled it. He put it away.

OPTION C

Jon looked at the gear he needed to pull. He chose a gear puller with the correct jaw width and spread length. He checked the puller. He wanted to see if it was bent or worn. He needed to know if the bolt threads were stripped. He made sure that the set screw was tight secured in the gear. He checked the shaft. He made sure there were foreign objects that would keep the gear from sliding off the shaft. He put the puller on the gear. He screwed the pressure screw in place until it touched the shaft. He checked the puller again to be sure it was properly positioned. He knew he needed to be able to pull the gear out at an angle. He turned the pressure bolt slowly counter lockwise. This applied pressure to the gear. He removed the goggles so he could see better. He continued to tighten the pressure bolt until he removed the gear from the shaft. He cleaned the puller, oiled it, and put it away.

Exercise 4

Bob is replacing a valve. He must remove the packing material from around it. He uses a packing puller to do the job. He follows the process below to select, inspect, use, and maintain the packing puller.

Step 1 Select a corkscrew-type puller of the proper size and length for the job.

Step 2 Inspect the puller to ensure that it is sharp and not bent out of shape.

Step 3 Insert the puller into the stuffing box, turning it one or two turns clockwise to screw it into the packing.

Step 4 Pull on the puller carefully to remove the packing from the box.

NOTE: Usually the packing will break up into small pieces when it is removed

Step 5 Repect step 4 until all the packing has been removed from the stuffing box.

NOTE: After the packing has been removed, there will usually be some packing pieces left that the corkscrew puller cannot pick

up. Choose a pick type puller and remove the packing pieces.
Choose a pick type puller and remove the packing pieces.

Step 6 Clean the pullers thoroughly.

Step 7 Coat the pullers lightly with oil to prevent rust.

Step 8 Store the pullers in their proper places.

Wheels of Learning, Millwright Module 15101, Millwright Hand Tools, p. 35-36.

Which job will Bob's supervisor most likely approve?

OPTION A

Bob measured the valve. He chose a corkscrew-type puller that was the right size and length. He checked the puller. He wanted to make sure it was still sharp. He needed to know that it had not been bent out of shape. He put the puller into the stuffing box. He turned it one or two turns clockwise to screw it into the packing. He pulled on the puller. This removed the packing from the box. The packing began to break into pieces. He continued to remove the packing until all large pieces were gone. He used a pick puller to remove the smaller pieces. He cleaned both pullers. He coated them with oil. He put the pullers away.

OPTION B

Bob measured the valve. He chose a corkscrew-type puller that was the right weight. He checked the puller. He wanted to make sure it wasn't too sharp. He needed to know that it had not been bent out of shape. He put the puller into the stuffing box. He turned it one or two turns counterclockwise to screw it into the packing. He pulled on the puller. This removed the packing from the box. The packing began to break into pieces. He continued to remove the packing until all large pieces were gone. He used a pick puller to remove the smaller pieces. He cleaned both pullers. He coated them with oil. He put the pullers away.

OPTION C

Bob measured the valve. He chose a pick puller that was the right size and length. He checked the puller. He wanted to make sure it was still sharp. He needed to know that it had not been bent out of shape. He put the puller into the stuffing box. He turned it one or two turns counterclockwise to screw it into the packing. He pulled on the puller. This removed the packing from the box. The packing began to break into pieces. He continued to remove the packing until all large pieces were gone. He used a corkscrew-type puller to remove the smaller pieces. He cleaned both pullers. He coated them with oil. He put the pullers away.

Exercise 5

Rick uses a diagonal cutter to snip wire. He uses the following steps to select, inspect, use, and maintain a diagonal cutter:

Step 1 Select a diagonal cutter of the proper size for the material to be cut.

Step 2 Inspect the cutter to ensure that the cutting edges are not nicked or dull.

Step 3 Position the cutter to cut the material in the desired location.

Step 4 Squeeze the handles of the cutter to cut the material.

Step 5 Clean the cutter.

Step 6 Store the cutter in its proper place.

Wheels of Learning, Millwright Module 15101, Millwright Hand Tools, p. 19.

What's the best way for Rick to use the cutter?

OPTION A

Rick checked the wire. He wanted to be sure he chose a cutter that was the right size. He chose a cutter. He looked at it to be sure the the cutting edges were not nicked or dull. He placed the cutter at the place he needed to cut. He squeezed the handles of the cutter. He cut the wire. He cleaned the cutter. Rick put it away.

OPTION B

Rick checked the wire. He wanted to be sure he chose a cutter that was the right size. He chose a cutter. He looked at it to be sure the the cutting edges were nicked and dull. He placed the cutter at the place he needed to cut. He squeezed the handles of the cutter. He cut the wire. He cleaned the cutter. Rick put it away.

OPTION C

Rick chose a cutter. He looked at it to be sure the the cutting edges were not too sharp. He checked the wire. He wanted to be sure he chose a cutter that was the right size. He placed the cutter at the place he needed to cut. He squeezed the handles of the cutter. He cut the wire. He cleaned the cutter. Rick put it away.

UNDERSTANDING SEQUENCES: FOLLOWING DIRECTIONS IN CONSTUCTION MATERIALS (*Answer Key Version)

Objective: To read to follow directions.

It was Ted's first day at work. He had just finished school. He never had a "real" job before. He wasn't sure what to do. He asked his foreman. The foreman said, "Clock in. Unload the truck. Sort the pipe by size. Stack it. Then see me. I'll tell you what else to do."

Ted wanted to make a good impression. He began unloading the truck. He stacked all the pipe. He finished the job. He looked at the stacks. Something looked wrong. He thought back. What did the foreman say? Right! He was supposed to sort the pipe first. Ted quickly sorted the pipe. He then stacked it. It looked much better. Ted had worked hard. He worked hard for the rest of the day. He worked hard all week.

Ted's first week ended. He got his paycheck. He opened it. Wait a minute! Something was wrong. Ted thought his check would be bigger. He worked hard. What happened to his money?

Ted talked to the foreman. The foreman looked at the check. He was surprised. He knew Ted was a hard worker. He

knew Ted worked all week. Where was Ted's money? The foreman pulled Ted's timesheet.

On Monday, Ted clocked in at 9:15. On Tuesday and Wednesday, he clocked at 10:00. On Thursday, Ted clocked in at 10:30. He clocked in Friday after lunch.

The foreman talked to Ted. He said, "Ted, you're a good worker. You come to work on time. You work hard each day. You need to change one thing. Think back. Each day, I told you what to do. Each day, I told you to clock in first. You wanted to get busy. You didn't clock in first. It just doesn't work that way. You have to do first things first. When you do things is often as important as how you do it."

Ted's foreman is talking about following directions. This means you do things is a certain order. Some things must be done first. Others must come last. Following directions means you understand the steps in instructions. These form a sequence--a step-by-step process.

Sometimes you don't have a foreman to tell you what to do. You must read information for yourself to find what to do. This information directs you. It tells you what to do at each step. Following directions is itself a process in which you do things in a certain order.

Every sequence has a purpose. This is its point or main idea. The main idea is usually a change or outcome. The steps, then, lead you to where you need to go. The point could be a change in a raw material. It could be a way to use a tool. It could be a way to insure safety. Finding the point is an important part of following directions.

STEPS IN FOLLOWING DIRECTIONS

1. Some directions begin with a heading or label. Read this first. This title often tells you the sequence's main idea.

2. Read the directions through. This reading gives you an overall sense of what to do. It tells you how many steps to do. You can also get an idea of how hard each step will be. NOTE: The directions may not seem to make sense. That's OK. Many directions seem unclear after first reading.

3. Decide what you think the point of the sequence is.

4. Read Step 1. Do what it says.

5. Continue reading. Follow each step until you reach the last step.

6. Reread the directions to check your work.

How do you know what steps are in a sequence? Sometimes, finding the steps is easy. Some directions include words like "STEP 1" "STEP 2" and so on. Other directions are harder to follow. Some directions use words like "ONE" or "FIRST" to show you where to start. Some use words like "SECOND," "THIRD," "NEXT," "AND THEN," or "NOW" to show you what else to do. Words like "LAST" or "FINALLY" help you find the end of the directions.

EXAMPLE:

Procedure for Using a Combination Bench and Pipe Vise

WARNING! Follow all safety precautions!

Step 1 Inspect the vise for any defects that might make it unsafe to use.

Step 2 Turn the handle counterclockwise to open the jaws.

Step 3 Place the workpiece between the jaws.

Step 4 Tighten the jaws by turning the handle clockwise until the work piece is held between the jaws so that the material does not slip.

WARNING! If the work piece slips in the vise, it can cause damage to the material or present a safety hazard.

Wheels of Learning Trainee Guide, Task Module 12101, Instrumentation, Hand Tools for Instrumentation. p. 15.

1. Some directions begin with a heading or label. Read this first. It often tells you the sequence's main idea. The title of the sequence is "PROCEDURE FOR USING A COMBINATION BENCH AND PIPE VISE."

2. Read the directions through. This reading gives you an overall sense of what you must do. You can also get an idea of how hard each step will be. NOTE: The directions may not make sense. That's OK. Many directions seem unclear after first reading. The procedure has four steps. The steps don't appear too hard.

3. Decide what you think the sequence's point is. This process tells how to open the jaws of a vise and insert a piece of work securely so that you can work on it.

4. Read Step 1. Do what it says. Step 1 involves safety-- you check the vise for problems before use.

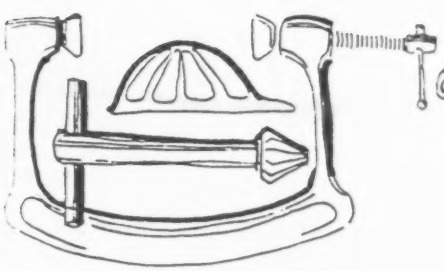
5. Continue reading. Follow each step until you reach the last step. Step 2 tells you how to open the jaws of the vise. You place the work into the jaws of the vise in Step 3. In Step 4, you tighten the jaws of the vise so that the work is secure.

6. Reread the directions to check your work. Check for defects first. Open the vise. Insert the work. Close the vise securely.

TECHNICAL DEVELOPMENT CENTER

ANSWER KEY

Electrical and Instrumentation



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Exercise 1

Jack used an electric percussion hammer to drill through some concrete. He reads the following from his Craft Training Handbook.

PROCEDURE FOR USING AN ELECTRIC PERCUSSION HAMMER

Before using an electric percussion hammer, know its applications and limitations. These can be found in the manufacturer's instructions. Electric percussion hammers can be used with drill bits, chisels, or other attachments. This procedure uses a drill bit.

WARNING! Follow all safety precautions.
Step 1 Select the correct drill bit for the job.

Step 2 Insert the drill bit in the chuck.

NOTE: If using a star drill, insert the chuck and handle assembly, lock it in place, and then insert the bit.

WARNING! Check that the bit is secure in the chuck. A loose bit can cause personal injury or damage to the work.

Step 3 Position the hammer at the angle desired for the hold. Position the bit firmly on the center mark.

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NOTE: Pull the trigger only after the bit is in position and firm pressure has been applied. The pressure holds the bit in place and prevents it from wandering. Never allow an electric hammer to idle. If there is no pressure being applied to the bit, the force of the reciprocating action of the bit is absorbed by the nose bushing. This can seriously damage the nose bushing.

Step 4 Squeeze the trigger, being sure to hold the hammer securely and straight while drilling to avoid jamming or binding the bit.

NOTE: Should the bit seize in the hole, reversing direction of the bit or using a rotating motion may loosen it.

Step 5 When finished drilling the hole, clean chips and debris out of hole with a squeeze bulb.

Warning: Do not use an air hose to clean out the hole.

Wheels of Learning Trainee Guide, Task Module 12103, Instrumentation, Power Tool for Instrumentation p 13-14

Which of the following best describes what Jack should have done?

OPTION A

Jack chose a drill bit. He inserted the drill bit in the chuck. He checked the hole. He cleaned chips and debris from the hole with an air hose. He squeezed the trigger. He held the hammer securely and straight. This kept the drill from jamming or binding the bit. He positioned the hammer at the angle desired for the hole. He positioned the bit firmly on the center mark.

*OPTION B

Jack chose the right drill bit for the job. He put the drill bit in the chuck. Jack held the hammer at the angle he needed. He carefully positioned the bit on the center mark. He squeezed the trigger. He kept the hammer from jamming by holding the hammer securely. He drilled the hole and cleaned it with a squeeze bulb.

OPTION C

Jack chose a drill bit. He inserted the drill bit in the chuck. He squeezed the trigger. He checked the hole. He cleaned chips and debris from the hole with an air hose. He positioned the hammer at the angle desired for the hole. He positioned the bit firmly on the center mark. He held the hammer securely and straight. This kept the drill from jamming or binding the bit.

EXERCISE 2

Jan is installing threaded fasteners. She is using a torque wrench to tighten the nuts. She reads the following in her ABC Craft Training handbook.

INSTALLING THREADED FASTENERS

The following general procedure can be used to install threaded fasteners in a variety of applications:

NOTE: When installing threaded fasteners for a specific job, make sure to check all installation requirements.

WARNING: Follow all safety precautions.

Step 1 Select the proper bolts or screws for the job.

Step 2 Check for damaged or dirty internal and external threads.

Step 3 Clean the bolt or screw threads. Do not lubricate the threads if a torque wrench is to be used to tighten the nuts.

Step 4 Insert the bolts through the pre-drilled holes and tighten the nuts by hand. Or, insert the screws through the holes and start the threads by hand.

NOTE: Turn the nuts or screws several turns by hand and check for cross threading.

Step 5 Following the proper tightening sequence, tighten the bolts or screws snug.

Step 6 Check the torque specification. Following the proper tightening sequence, tighten each bolt, nut, or screw several times approaching the specified torque. Tighten to the final torque specification.

Step 7 If required to keep the bolts or nuts from working loose, install jam nuts, cotter pins, or safety wire.

Wheels of Learning Trainee Guide, Task Module 12106, Instrumentation, Instrumentation Fasteners p 34

Which of the following best describes what Jan should do?

OPTION A

Jan should choose the bolts she needs. She should then clean each one. She must check for damaged internal and external threads. She needs to carefully lubricate the threads. She should install jam nuts to keep the bolts from working loose. She will then insert the bolts through the pre-drilled holes. She should tighten the nuts by hand. She will tighten the bolts snug by following the proper tightening sequence. She will then check the torque specification. She must tighten each bolt several times to approach the desired torque. Lastly, she will tighten the bolts to the final torque specifications.

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OPTION B

Jan should choose the bolts she needs. She must check for damaged internal and external threads. She should then clean each one. She needs to carefully lubricate the threads. She will then insert the bolts through the pre-drilled holes. She should install jam nuts to keep the bolts from working loose. She should tighten the nuts by hand. She will tighten the bolts snug by following the proper tightening sequence. She will then check the torque specification. She must tighten each bolt several times to approach the desired torque. Lastly, she will tighten the bolts to the final torque specifications.

*OPTION C

Jan should choose the bolts she needs. She must check for damaged internal and external threads. She should then clean each one. She should not lubricate the threads because she is using a torque wrench. She will then insert the bolts through the pre-drilled holes. She should tighten the nuts by hand. She will tighten the bolts snug by following the proper tightening sequence. She will then check the torque specification. She must tighten each bolt several times to approach the desired torque. Lastly, she will tighten the bolts to the final torque specifications. She should install jam nuts to keep the bolts from working loose.

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EXERCISE 3

Vu is going to install blind rivets through drilled holes with a pop rivet tool. He reads the following information in his ABC Craft Training handbook.

INSTALLING BLIND RIVETS

Blind rivets are installed through drilled or punched holes with a special blind (pop) rivet tool. Use the following general procedure to install blind rivets:

WARNING: Follow all safety precautions.

WARNING: Make sure to wear proper eye and face protection when riveting.

Step 1 Select the correct length and diameter of blind rivet to be used.

Step 2 Select the appropriate drill bit for the size of rivet being used.

Step 3 Drill a hole through both parts being connected.

Step 4 Inspect the rivet gun for any defects that might make it unsafe for use.

Step 5 Place the rivet mandrel into the proper sized setting tool.

Step 6 Insert the rivet end into the pre-drilled hole.

Step 7 Install the rivet by squeezing the handle of the rivet gun causing the jaws in the setting tool to grip the mandrel. The mandrel is pulled up, expanding the rivet until it breaks at the shear point.

Step 8 Inspect the rivet to make sure the pieces are firmly riveted together and that the rivet is properly installed.

Wheels of Learning Trainee Guide, Task Module 12106, Instrumentation, Instrumentation Fasteners . p. 35-36

Which of the following best describes what Vu did?

OPTION A

First, Vu put on a protective face mask. He then selected the correct length and diameter of the blind rivet he needed. He chose the appropriate drill bit for the size of rivet being used. He drilled a hole through both parts being connected. He placed the rivet mandrel into the proper-sized setting tool. He inspected the rivet gun for defects. He inserted the rivet end into the pre-drilled hole. He installed the rivet by squeezing the handle of the rivet gun. Vu inspected the rivet to be sure the pieces were firmly riveted together.

*OPTION B

First, Vu put on a protective face mask. He then selected the correct length and diameter of the blind rivet he needed. He chose the appropriate drill bit for the size of rivet being used. He drilled a hole through both parts being connected. He inspected the rivet gun for defects. He placed the rivet mandrel into the proper-sized setting tool. He inserted the rivet end into the pre-drilled hole. He installed the rivet by squeezing the handle of the rivet gun. Vu inspected the rivet to be sure the pieces were firmly riveted together.

OPTION C

First, Vu put on a protective face mask. He chose the appropriate drill bit for the size of rivet being used. He drilled a hole through both parts being connected. He then selected the correct length and diameter of the blind rivet he needed. He placed the rivet mandrel into the proper-sized setting tool. He inspected the rivet gun for defects. He inserted the rivet end into the pre-drilled hole. He installed the rivet by squeezing the handle of the rivet gun. Vu inspected the rivet to be sure the pieces were firmly riveted together.

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EXERCISE 4

G.J. is using toggle bolts to fasten a mount to wallboard. He reviews the following information from his ABC manual.

INSTALLING TOGGLE BOLTS

Toggle bolts are used to fasten a part to hollow block, wallboard, plaster, panel, or tile. The following general procedure can be used to install toggle bolts.

WARNING! Follow all safety precautions.

Step 1 Select the proper size of drill bit or punch and toggle bolt for the job.

Step 2 Check the toggle bolt for damaged or dirty threads or a malfunctioning wing mechanism.

Step 3 Clean and lightly lubricate the threads of the bolt.

Step 4 Using the correct size of drill bit, drill a hole completely through the surface to which the part is to be fastened.

Step 5 Insert the toggle bolt through the opening in the item to be fastened.

Step 6 Screw the toggle wing onto the end of the toggle bolt, ensuring that the flat size of the toggle wing is facing the bolt head.

Step 7 Fold the wings completely back and push them through the drilled hole until the wings spring open.

Step 8 Tighten the toggle bolt with a screwdriver until it is snug.

Wheels of Learning Trainee Guide, Task Module 12106, Instrumentation, Instrumentation Fasteners p. 37

Which of the following best describes what G.J. should have done?

***OPTION A**

G.J. looked at the mount. He chose a toggle bolt that was the proper size for the job. He picked a drill bit to match it. He checked the bolt to make sure it was clean. He looked to see that the wing mechanism was working. He cleaned the threads on the bolt. He oiled them. He drilled a hole through the wallboard. He put the bolt through the hole in the mount. He screwed the toggle wing on the end of the toggle bolt. He made sure that the flat side of the wing faced the bolt head. He folded the wings back. He pushed the wings through the hole. He let the wings spring open. He pulled the mount back to hold the wings against the inside of the wallboard. He tightened the toggle with a screwdriver until snug.

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OPTION B

G.J. looked at the mount. He drilled a hole through the wallboard. He chose a toggle bolt that was the proper size for the job. He cleaned the threads on the bolt. He oiled them. He picked a drill bit to match it. He checked the bolt to make sure it was clean. He looked to see that the wing mechanism was working. He put the bolt through the hole in the mount. He screwed the toggle wing on the end of the toggle bolt. He made sure that the flat side of the wing faced the bolt head. He folded the wings back. He pushed the wings through the hole. He let the wings spring open. He pulled the mount back to hold the wings against the inside of the wallboard. He tightened the toggle with a screwdriver until snug.

OPTION C

G.J. looked at the mount. He drilled a hole through the wallboard. He put the bolt through the hole in the mount. He chose a toggle bolt that was the proper size for the job. He picked a drill bit to match it. He checked the bolt to make sure it was clean. He looked to see that the wing mechanism was working. He cleaned the threads on the bolt. He oiled them. He screwed the toggle wing on the end of the toggle bolt. He made sure that the flat side of the wing faced the bolt head. He folded the wings back. He pushed the wings through the hole. He let the wings spring open. He pulled the mount back to hold the wings against the inside of the wallboard. He tightened the toggle with a screwdriver until snug.

EXERCISE 5

Loyd replaced a gasket on a flange. He had to layout a new one. He used the following information from his ABC training guide:

LAYING OUT NEW GASKET
The following procedure describes how to lay out and cut a new gasket for a pipe flange.

WARNING! Follow all safety precautions.

Step 1 Select the proper gasket material for the conditions and process.

Step 2 Take three measurements (draw each as concentric circles):
* diameter of pipe opening,
* outside diameter of flange, and
* diameter of the bolt hole circle.
The diameter of the bolt circle is found by measuring from the bottom (or top) of opposite holes.

Step 3 Find the radius of the bolt circle. The radius of the bolt circle is equal to half of the diameter.

Step 4 Draw a line through the circle's center for opposite holes.

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Step 5 On a 6-hole flange, the radius is equal to the distance between bolt holes.

Step 6 To check the distance, walk the dividers around the circle.

NOTE: Lay out holes a little larger than their actual size. Gaskets with an even number of holes (i.e., 4, 8, 16) can also be laid out using the "swing arc" method. This method uses the divider to bisect distances. Flanges with an odd number of holes can be laid out using a protractor (simply divide 360 degrees by the number of holes) or by using the mathematical method.

Step 7 Cut out the gasket using a gasket cutter.

NOTE: The blade should not protrude more than 1/32" more than the thickness of the gasket material. Never hammer the gasket, as hammering may cause lumps in the gasket.

Step 8 Place the gasket material on hard wood to protect the punch edge. Then, punch out the holes using a hole punch

Wheels of Learning, Instrumentation Module 12108 Gaskets and Packing, p. 10-12.

Loyd's foreman is checking his work. Which of the following will get an "OK" from the foreman?

OPTION A

Loyd chose a material suitable for the conditions and process. He drew a line through the center of the circle for opposite holes. Since he was cutting a 6-hole flange, he found the radius was equal to the distance between the bolt holes. He walked the dividers around the hole to check his work. He measured the diameter of the pipe opening. He measured the outside diameter of the flange. He measured the diameter of the bolt hole circle. He figured the radius of the bolt circle. He used a gasket cutter to cut the gasket. He placed the gasket material on hard wood to protect the punch edge. He punched out the holes.

OPTION B

Loyd chose a material suitable for the conditions and process. He measured the diameter of the pipe opening. He measured the outside diameter of the flange. He measured the diameter of the bolt hole circle. He figured the radius of the bolt circle. Since he was cutting a 6-hole flange, he found the radius was equal to the distance between the bolt holes. He walked the dividers around the hole to check his work. He used a gasket cutter to cut the gasket. He drew a line through the center of the circle for opposite holes. He punched out the holes. He placed the gasket material on hard wood to protect the punch edge.

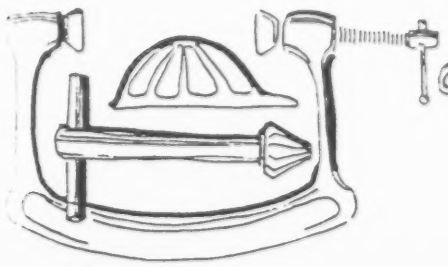
*OPTION C

Loyd chose a material suitable for the conditions and process. He measured the diameter of the pipe opening. He measured the outside diameter of the flange. He measured the diameter of the bolt hole circle. He figured the radius of the bolt circle. He drew a line through the center of the circle for opposite holes. Since he was cutting a 6-hole flange, he found the radius was equal to the distance between the bolt holes. He walked the dividers around the hole to check his work. He used a gasket cutter to cut the gasket. He placed the gasket material on hard wood to protect the punch edge. He punched out the holes.

TECHNICAL DEVELOPMENT CENTER

ANSWER KEY

Pipefitting



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Exercise 1

Carl used a manual bender--a hickey--to bend pipe before installing. He was supposed to use the following steps from his ABC Craft Handbook:

Step 1 Determine the size of the pipe to be bent.

Step 2 Select the proper size of bender.

Step 3 Mark the pipe at the beginning of the bend.

Step 4 Lay the pipe on the floor.

Step 5 Slide the bender onto the pipe at the start of the bend.

Step 6 Grip the handle, and pull the bender down toward the floor to make the bend.

NOTE: The thin-wall conduit bender will make a smooth bend with one long pull of the handle; it has a heel that you can press with your foot to assist in bending the pipe. The pipe and heavy-wall conduit bender requires you to make a small bend, slide the bender along the pipe a short distance, and make another bend until the proper bend in achieved.

Step 7 Stop the bend when the required bend angle is achieved.

CAUTION Be careful not to bend the pipe past the required angle. It is difficult to straighten pipe without damaging it.

Step 8 Remove the bender from the pipe.

Step 9 Check the pipe for cracking or kinking.

Step 10 Store the bender it its proper place.

Wheels of Learning Trainee Guide, Task Module 08101, Pipefitter Hand Tools, p 68-69

Using this process, Carl correctly bent the pipe. Which of the following did Carl probably do?

OPTION A

Carl measured the pipe. It was 1/2 inch pipe. He chose the right bender size. He found where the beginning of the pipe should be and marked the pipe. He put the pipe on the floor. He slid the bender on the pipe at the start of the bend. Carl carefully gripped the handle. He pulled the bender down toward the floor to make the bend. He stopped when the bend reached the correct angle. He removed the hickey. He looked at the pipe to see if it was cracked or kinked. He put the bender away.

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OPTION B

Carl chose the right bender size and measured the pipe. It was 1/2 inch pipe. He found where the beginning of the pipe should be and marked the pipe. He put the pipe on the floor. He slid the bender on the pipe at the start of the bend. Carl carefully gripped the handle. He pulled the bender up away from the floor to make the bend. He stopped when the bend reached the correct angle. He looked at the pipe to see if it was cracked or kinked. He removed the hickey. He put the bender away.

OPTION C

Carl chose the right bender size and measured the pipe. It was 1/2 inch pipe. He marked the pipe. He found where the beginning of the pipe should be. He put the pipe on the floor. Carl carefully gripped the handle of the hickey. He slid the bender on the pipe at the start of the bend. He pulled the bender up away from the floor to make the bend. He stooped when the bend reached the correct angle. He locked at the pipe to see if it was cracked or kinked. He removed the hickey. He put the bender away.

Exercise 2

Jay has been cutting steel pipe with a portable band saw. The blade has become worn. He needs to replace it. He knows that this requires the following method:

WARNING! Make sure the portable band saw is unplugged before replacing the blade.

Step 1 Rotate the blade adjust knob 180 degrees to release the tension on the blade.

Step 2 Turn the saw upside down on your work table.

Step 3 Remove the blade from the blade pulleys underneath the saw.

WARNING! Be careful when removing the blade, because the blade has a tendency to spring out when you take it off the blade pulleys.

Step 4 Slip a new blade around the blade pulleys.

Step 5 Slip the new blade into the blade guide and the back stop.

Step 6 Turn the saw over, and rotate the blade adjust knob to put tension on the blade.

Jay had some problems changing the blade in the saw. What should Jay do to correctly replace the saw blade?

OPTION A

Jay should should rotate the blade adjust knob a quarter-turn. This will increase tension on the blade. He should hold the saw rightside up. He should take the blade from the blade pulleys on the top of the saw. He should then slip the blade around the blade pulleys. He should then slip the new blade into the blade guide. The new blade should slip into the back stop. Jay should turn the saw over and rotate the blade adjust knob to release tension on the blade.

OPTION B

Jay should unplug the saw first. He should rotate the blade adjust knob a full turn. This will increase tension on the blade. He should hold the saw upside down. He should take the blade from the blade pulleys underneath the saw. He should then slip the blade over the blade pulleys. He should then slip the new blade into the blade guide. The new blade should slip into the back stop. Jay should turn the saw over and rotate the blade adjust knob to release tension on the blade.

*OPTION C

Jay should unplug the saw first. He should rotate the blade adjust knob a half-turn. This wii/ release tension on the blade. He should hold the saw upside down. He should take the blade from the blade pulleys underneath the saw. He should then slip the blade around the blade pulleys. He should then slip the new blade into the blade guide. The new blade should slip into the back stop. Jay should turn the saw over and rotate the blade adjust knob to regain tension on the blade.

Exercise 3

Vic is a new employee. He will be using a portable pneumatic grinder. His supervisor gives him the following information so Vic can inspect the grinder before use.

Step 1 Inspect the air inlet and the air line of a pheumatic grinder to ensure there are no signs of damage that could cause a bad connection or loss of air.

Step 2 Inspect the power cord and plug in electric models to ensure there are no signs of damage.

Step 3 Inspect the handle to make sure it is not loose, which could cause a loss of control.

Step 4 Inspect the grinder housing and body for defects.

Step 5 Ensure that the trigger switch works properly and does not stick in the ON position.

Step 6 Ensure that the safety guard is in good condition and securely attached to the grinder.

Step 7 Check the oil level in pneumatic grinders.

Step 8 Ensure that the maximum rotating speed of the grinding wheel is higher than the maximum rotating speed of the grinder.

Step 9 Start the grinder, and allow it to run for 1 to 2 minutes while checking for visual abnormalities, excessive vibration, extreme temperature changes, or noisy operation.

Step 10 Inspect the work area to ensure the safety of yourself and others and to make sure that the heat and sparks generated by the grinder cannot start any fires.

Wheels of Learning Trainee Guide, Task Module 08102, Pipefitter Power Tools, p. 9-10

Which of the following will get an OK from Vic's supervisor?

***OPTION A**

Vic checked the air intake and air line. He checked for other signs of damage that would result in a loss of air. He checked the grinder's handle, housing, and body. He made sure that the trigger was working properly. He examined the safety guard and made sure it was attached to the grinder. He checked the oil level. He made sure that the maximum rotating speed of the grinding wheel was higher that the maximum rotating speed of the grinder. He started the grinder. He let it run for a couple of minutes. He looked at the grinder to see if he saw anything wrong. He felt to see if it vibrated too much or got too hot. He listened to see if the grinder ran more loudly than usual. Vic checked the work area. He saw some papers that could catch on fire. He put the papers away.

OPTION B

Vic checked the grinder's handle, housing, and body. He made sure that the trigger was working properly. He examined the safety guard and made sure it was attached to the grinder. Vic checked the air intake and air line. He checked for other signs of damage that would result in a loss of air. He checked the oil level. He made sure that the maximum rotating speed of the grinding wheel was higher that the maximum rotating speed of the grinder. He started the grinder. He let it run for a couple of minutes. He looked at the grinder to see if he saw anything wrong. He felt to see if it vibrated too much or got too hot. He listened to see if the grinder ran more loudly than usual. Vic checked the work area. He saw some papers that could catch on fire. He put the papers away.

OPTION C

Vic started the grinder. He let it run for a couple of minutes. He looked at the grinder to see if he saw anything wrong. He felt to see if it vibrated too much or got too hot. He listened to see if the grinder ran more loudly than usual. Vic checked the air intake and air line. He checked for other signs of damage that would result in a loss of air. He checked the grinder's handle, housing, and body. He made sure that the trigger was working properly. He examined the safety guard and made sure it was attached to the grinder. He checked the oil level. He made sure that the maximum rotating speed of the grinding wheel was higher that the maximum rotating speed of the grinder. Vic checked the work area. He saw some papers that could catch on fire. He put the papers away.

Exercise 4

Zach must make sure a joint in 5/8 inch pipe is leakproof. He will be using Teflon tape. He reviews the following from his ABC craft training manual:

Warning! Never use Teflon tape on pipe that is to be welded or pipe that carries steam or other high-temperature service. When Teflon tape is heated, it emits a highly toxic gas that could be fatal.

Step 1 Remove all excess cutting oil from the threads to improve the grip of the tape on the threads.

NOTE: Use 1/2 inch wide Teflon tape for pipe that is 3/4 inch nominal size and smaller. Use 3/4 inch wide tape for pipe that is 1-inch nominal size or larger.

Step 2 Start the tape from the end of the pipe, leaving the first full thread bare to prevent the tape from bunching up at the beginning of the thread.

Step 3 Wrap the tape around the pipe in the direction that the joint is to be assembled.

NOTE: Tape should be wrapped around right-hand threads in a clockwise direction and around left-hand threads in a counterclockwise direction.

Step 4 Continue to wrap the tape around the joint, overlapping the edges of each wrap until all remaining threads have been covered.

Step 5 Press the tape against the threads to seal it to the threads and prevent the tape from slipping off the threads once you start to make up the joint.

What is the proper way for Zach to wrap the pipe with Teflon tape?

OPTION A

Zach used a cloth to remove the cutting oil from the threads of the pipe. He got a roll of 1 inch Teflon tape. He started taping from the middle of the pipe. He left the first full thread bare. He didn't want it to bunch in the middle of the pipe. He wrapped it clockwise because he used right-hand threads. He wrapped the pipe. He overlapped the edges until he could no longer see any threads. He smoothed the tape against the threads to seal it. He knew this would also prevent it from slipping when he made up the joint.

*OPTION B

Zach used a cloth to remove the cutting oil from the threads of the pipe. He got a roll of 1/2 inch Teflon tape. He started taping from the end of the pipe. He left the first full thread bare. He didn't want it to bunch at the end of the thread. He wrapped it clockwise because he used right-hand threads. He wrapped the pipe. He overlapped the edges until he could no longer see any threads. He smoothed the tape against the threads to seal it. He knew this would also prevent it from slipping when he made up the joint.

OPTION C

Zach used a cloth to remove the cutting oil from the threads of the pipe. He got a roll of 1 inch Teflon tape. He started taping from the end of the pipe. He didn't want it to bunch at the end of the thread. He wrapped it counterclockwise because he used right-hand threads. He wrapped the pipe. He overlapped the edges until he could no longer see any threads. He smoothed the tape against the threads to seal it. He knew this would also prevent it from slipping when he made up the joint.

Exercise 5

Lee's company got a contract to replace a piping system. She will be fitting screwed pipe and fittings. Lee knows she must use the following procedure:

Step 1 Determine the type, size, and schedule of pipe being used in the system.

Step 2 Determine the length of pipe needed.

Step 3 Cut the pipe to the desired length.

Step 4 Ream the pipe to remove all internal burrs.

Step 5 Thread the pipe, taking caution not to cut the threads too deep.

Step 6 Select the proper size, shape, and type of fittings needed.

Step 7 Clean the pipe and fittings thoroughly inside and out.

NOTE: All sand, dirt, and oil must be removed from the inside of the pipe and fittings to avoid contaminating the system or clogging the line. The fittings and pipe ends may be cleaned with a clean rag soaked in nonflammable solvent.

Step 8 Check the threads on the pipe and the fitting to ensure that they are properly cut and not damaged.

Step 9 Apply joint compound or Teflon tape to the pipe threads.

Step 10. Start the fitting on the pipe by hand.

Step 11. Tighten the fitting slowly, using a pipe wrench.

CAUTION: Tightening the fitting quickly causes excessive heat due to friction, which could cause the threads or the fitting to expand. Do not allow the threads to bottom out into the fitting. This can damage the threads and the fitting.

Wheels of Learning Trainee Guide, Task Module 08103, Pipefitting, Threaded Pipe Fabrication, p. 45-46

If Lee did the job correctly, what did she do?

OPTION A

Lee checked the system. She measured the section that needed replacing. It was 24 inches long. She cut a new piece of schedule 40 carbon steel 2 inch pipe. She needed to remove some external burrs, so she reamed it. She carefully threaded the pipe. She selected a fitting based on the size, shape, and type. She got a rag and some flammable solvent. She cleaned the pipe and the fitting inside and outside. Lee checked the pipe's threads to make sure she had cut them accurately. She put joint compound on the threads. She started fitting the pipe by hand. Lee used a pipe wrench to slowly tighten the fitting. She made sure that the threads did not bottom out into the fitting.

*OPTION B

Lee checked the system. She noted that the pipes were schedule 40 carbon steel 2 inch pipe. She measured the section that needed replacing. It was 24 inches long. She cut a new piece of schedule 40 carbon steel 2 inch pipe. She needed to remove some internal burrs, so she reamed it. She carefully threaded the pipe. She selected a fitting based on the size, shape, and type. She got a rag and some nonflammable solvent. She cleaned the pipe and the fitting inside and outside. Lee checked the pipe's threads to make sure she had cut them accurately. She put joint compound on the threads. She started fitting the pipe by hand. Lee used a pipe wrench to slowly tighten the fitting. She made sure that the threads did not bottom out into the fitting.

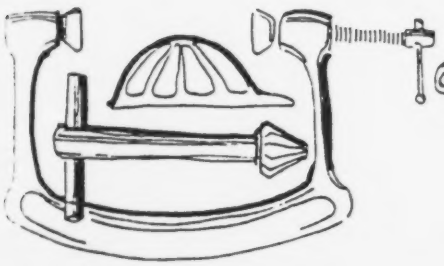
OPTION C

Lee checked the system. She measured the section that needed replacing. It was 24 inches long. She selected a fitting based on the size, shape, and type she needed. She noted that the pipes were schedule 40 carbon steel 2 inch pipe. She cut a new piece of schedule 40 carbon steel 2 inch pipe. She needed to remove some internal burrs, so she reamed it. She carefully threaded the pipe. She got a rag and some nonflammable solvent. She cleaned the pipe and the fitting inside and outside. Lee checked the pipe's threads to make sure she had cut them accurately. She put joint compound on the pipe being careful not to get any on the threads. Lee used a pipe wrench to slowly begin fitting the pipe. She made sure that the threads did not bottom out into the fitting. She tightened the fittings by hand.

TECHNICAL DEVELOPMENT CENTER

ANSWER KEY

Millwright



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Exercise 1

Gabe is installing gaskets. He uses a putty knife to scrape off the old gaskets. He used the following steps to select, inspect, use and maintain the putty knife.

Step 1 Select a putty knife of the proper length and width to do the job.

WARNING! Do not choose a knife that is larger than needed and cannot be handled safely.

Step 2 Inspect the putty knife to ensure that the blade is not bent or dull and that the handle is in good condition and firmly attached to the blade.

Step 3 Hold the knife in one hand at an angle to the work, and scrape the gasket off using smooth, even strokes.

WARNING! Do not try to chip the gasket with the putty knife. This could nick the surface being scraped and dull the knife. Keep the knife blade flat on the surface. Do not try to scrape the side edge of the blade. Keep your hands away from the cutting edge of the blade, and work away from your body to prevent personal injury.

Step 4 Continue to scrape the surface until all the gasket is removed.

Step 5 Clean the knife thoroughly with a rag, using solvent if needed.

Step 6 Oil the knife lightly to prefent rust.

Step 7 Store the knife in its proper place.

Wheels of Learning, Millwright Module 15101, Millwright Hand Tools p 17.

What is the proper procedure for Gabe to use?

OPTION A

Gabe checked the gasket. He chose a putty knife that was appropriate in length and width. He looked at the blade to be sure it wasn't bent or dull. He looked at the handle to be sure it was in good condition and firmly attached to the blade. He held the knife in both hands. He made sure that he never held it at an angle to the gasket. He used short, choppy strokes to remove the gasket. He kept the blade flat on the surface. He made sure that he did not use the blade edge as a scraper. He kept his hands away from the cutting edge. He was careful to cut toward his body. Gabe kept scraping until all the gasket was removed. He carefully cleaned the knife and oiled it. He put the putty knife away.

OPTION B

Gabe checked the gasket. He chose a putty knife that was appropriate in weight. He looked at the blade to be sure it wasn't too sharp for the gasket. He looked at the handle to be sure it was in good condition and firmly attached to the blade. He held the knife in one hand. He made sure that he held it at an angle to the gasket. He used smooth, even strokes to remove the gasket. He kept the blade vertical on the surface. He made sure that he did not use the side edge as a scraper. He kept his hands away from the cutting edge. He was careful to cut away from his body. Gabe kept scraping until all the gasket was removed. He carefully oiled the knife. He put the putty knife away.

*OPTION C

Gabe checked the gasket. He chose a putty knife that was appropriate in length and width. He looked at the blade to be sure it wasn't bent or dull. He looked at the handle to be sure it was in good condition and firmly attached to the blade. He held the knife in one hand. He made sure that he held it at an angle to the gasket. He used smooth, even strokes to remove the gasket. He kept the blade flat on the surface. He made sure that he did not use the side edge as a scraper. He kept his hands away from the cutting edge. He was careful to cut away from his body. Gabe kept

scraping until all the gasket was removed. He carefully cleaned the knife and oiled it. He put the putty knife away.

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Exercise 2

Karl is connecting flanges and structural steel. He aligns bolt holes with drift pins. He uses the following steps to select, inspect, use, and maintain the pins.

Step 1 Select a pin of the proper size for the holes being aligned.

NOTE: The proper size drift pin will fit all the way through both holes being aligned and still be large enough and strong enough to pull the mating pieces together.

Step 2 Inspect the pin to ensure that it is not bent and that it does not have burrs that could cut your hands.

Step 3 Insert the pin into the holes of the mating pieces, and use it to pull the holes into alignment.

Step 4 Clamp the mating pieces together using a C-clamp, if possible, to hold the parts in alignment while the pin is removed and a bolt installed in its place.

NOTE: On pieces with more than one hole, the drift pin can be left in until bolts can be installed in the other holes. Then the drift pin is removed, and a bolt is installed in its place.

Step 5 Clean the pin, using a rag and solvent if needed.

Step 6 Cover the pin with a light coat of oil to prevent rust.

Step 7 Store the pin in its proper place.

Wheels of Learning. Millwright Module 15101. Millwright Hand Tools p. 18.

What would have been the best way for Karl to use a drift pin?

OPTION A

Karl measured the size of the holes he needed to align. He chose a pin to match. He checked the pin to see that it was not bent. He made sure there was nothing sharp that might cut his hands. He put the pin into the holes of the mating piece. He used that to pull the holes into the correct position. He got a C-clamp. He used that to put the mating pieces together. He removed the pin and installed a bolt in its place. Some dirt got on the pin. He cleaned it with a rag and solvent. He coated with pin with oil. He put the pin back.

OPTION B

Karl measured the size of the holes he needed to align. He chose a pin to match. He checked the pin to see that it was not bent. He made sure there was nothing sharp that might cut his hands. He made sure that he did not put the pin into the holes of the mating piece. He pulled the holes into the correct position. He got a C-clamp. He used that to put the mating pieces together. He removed the pin and installed a bolt in its place. Some dirt got on the pin. He cleaned it with a rag and oil. He coated with pin with solvent to prevent rust. He put the pin back.

OPTION C

Karl chose a pin. He got a C-clamp. He checked the pin to see that it was not bent. He made sure there was nothing sharp that might cut his hands. Karl measured the size of the holes he needed to align. He used the pin to pull the holes into the correct position. He used the C-clamp to put the mating pieces together. He removed the pin and installed a bolt in its place. Some dirt got on the pin. He cleaned it with a rag and solvent. He coated with pin with oil. He put the pin back.

Exercise 3

Jon must install some new gears. The gears he is replacing are precision gears which were press-fitted in place. He finds a couple of them particularly difficult to remove. Jon doesn't want to damage the gear, so he decided to get a gear puller. He uses the following process to select, inspect, use, and maintain a gear puller.

Step 1 Select a gear puller with the correct jaw length and spread width for the gear or bearing being pulled.

Step 2 Inspect the puller to ensure that the jaws are not bent or excessively worn and that the pressure bolt threads are not stripped.

Step 3 Ensure that all set screws or locking screws have been loosened or removed from the gear or bearing.

Step 4 Inspect the shaft to ensure that there are no nicks, burrs, or foreign objects that would interfere with the gear or bearing sliding off the shaft.

Step 5 Position the puller on the gear or bearing, and screw the pressure screw in until it presses against the shaft.

Step 6 Check the puller to ensure that the jaws are properly positioned on the gear or bearing.

CAUTION: The puller jaws must be positioned so that they will provide a straight, even pull on the gear or bearing and not damage it.

Step 7 Turn the pressure bolt slowly clockwise to begin applying pressure to the gear or bearing.

WARNING! Always wear eye protection when using a puller, because particles could break off and injure your eyes.

Step 8 Continue to tighten the pressure bolts until the gear or bearing is removed from the shaft.

Step 9 Clean the puller thoroughly.

Step 10 Coat the puller lightly with oil to prevent rust.

Step 11 Store the puller in its proper place.

Wheels of Learning, Millwright Module 15101, Milwrg Hand Tools p 34-35.

What is NOT the correct way for Jon to use the gear puller?

OPTION A

Jon looked at the gear he needed to pull. He chose a gear puller with the correct jaw length and spread width. He checked the puller. He wanted to see if it was bent or worn. He needed to know if the bolt threads were stripped. He made sure that the set screw was loosened and removed from the gear. He checked the shaft. He made sure there were no foreign objects that would keep the gear from sliding off the shaft. He put the puller on the gear. He screwed the pressure screw in place until it touched the shaft. He checked the puller again to be sure it was properly positioned. He knew he needed to be able to evenly pull the gear straight out. He turned the pressure bolt slowly clockwise. This applied pressure to the gear. He put goggles on. He continued to tighten the pressure bolt until he removed the gear from the shaft. He cleaned the puller, oiled it, and put it away.

OPTION B

Jon looked at the gear he needed to pull. He chose a gear puller with the correct jaw length and spread width. He checked the puller. He wanted to see if there was anything wrong with it. He needed to know if the bolt threads were stripped. He put goggles on. He loosened the set screw and removed it from the gear. He checked the shaft. He made sure there were no nicks or burrs that would keep the gear from sliding off the shaft. He put the puller on the gear. He screwed the pressure screw in place until it touched the shaft. He checked the puller again to be sure it was properly positioned. He knew he needed to be able to evenly pull the gear straight out. He turned the pressure bolt slowly clockwise. This applied pressure to the gear. He continued to tighten the pressure bolt until he removed the gear from the shaft. He cleaned the puller. He oiled it. He put it away.

*OPTION C

Jon looked at the gear he needed to pull. He chose a gear puller with the correct jaw width and spread length. He checked the puller. He wanted to see if it was bent or worn. He needed to know if the bolt threads were stripped. He made sure that the set screw was tight secured in the gear. He checked the shaft. He made sure there were foreign objects that would keep the gear from sliding off the shaft. He put the puller on the gear. He screwed the pressure screw in place until it touched the shaft. He checked the puller again to be sure it was properly positioned. He knew he needed to be able to pull the gear out at an angle. He turned the pressure bolt slowly counter lockwise. This applied pressure to the gear. He removed the goggles so he could see better. He continued to tighten the pressure bolt until he removed the gear from the shaft. He cleaned the puller, oiled it, and put it away.

Exercise 4

Bob is replacing a valve. He must remove the packing material from around it. He uses a packing puller to do the job. He follows the process below to select, inspect, use, and maintain the packing puller.

Step 1 Select a corkscrew-type puller of the proper size and length for the job.

Step 2 Inspect the puller to ensure that it is sharp and not bent out of shape.

Step 3 Insert the puller into the stuffing box, turning it one or two turns clockwise to screw it into the packing.

Step 4 Pull on the puller carefully to remove the packing from the box.

NOTE: Usually the packing will break up into small pieces when it is removed.

Step 5 Repeat step 4 until all the packing has been removed from the stuffing box.

NOTE: After the packing has been removed, there will usually be some packing pieces left that the corkscrew puller cannot pick

up. Choose a pick type puller and remove the packing pieces. Choc se a pick type puller and remove the packing pieces.

Step 6 Clean the pullers thoroughly.

Step 7 Coat the pullers lightly with oil to prevent rust.

Step 8 Store the pullers in their proper places.

Wheels of Learning, Millwright Module 15101, Millwright Hand Tools, p 35-36.

Which job will Bob's supervisor most likely approve?

**** OPTION A***

Bob measured the valve. He chose a corkscrew-type puller that was the right size and length. He checked the puller. He wanted to make sure it was still sharp. He needed to know that it had not been bent out of shape. He put the puller into the stuffing box. He turned it one or two turns clockwise to screw it into the packing. He pulled on the puller. This removed the packing from the box. The packing began to break into pieces. He continued to remove the packing until all large pieces were gone. He used a pick puller to remove the smaller pieces. He cleaned both pullers. He coated them with oil. He put the pullers away.

OPTION B

Bob measured the valve. He chose a corkscrew-type puller that was the right weight. He checked the puller. He wanted to make sure it wasn't too sharp. He needed to know that it had not been bent out of shape. He put the puller into the stuffing box. He turned it one or two turns counterclockwise to screw it into the packing. He pulled on the puller. This removed the packing from the box. The packing began to break into pieces. He continued to remove the packing until all large pieces were gone. He used a pick puller to remove the smaller pieces. He cleaned both pullers. He coated them with oil. He put the pullers away.

OPTION C

Bob measured the valve. He chose a pick puller that was the right size and length. He checked the puller. He wanted to make sure it was still sharp. He needed to know that it had not been bent out of shape. He put the puller into the stuffing box. He turned it one or two turns counterclockwise to screw it into the packing. He pulled on the puller. This removed the packing from the box. The packing began to break into pieces. He continued to remove the packing until all large pieces were gone. He used a corkscrew-type puller to remove the smaller pieces. He cleaned both pullers. He coated them with oil. He put the pullers away.

Exercise 5

Rick uses a diagonal cutter to snip wire. He uses the following steps to select, inspect, use, and maintain a diagonal cutter:

Step 1 Select a diagonal cutter of the proper size for the material to be cut.

Step 2 Inspect the cutter to ensure that the cutting edges are not nicked or dull.

Step 3 Position the cutter to cut the material in the desired location.

Step 4 Squeeze the handles of the cutter to cut the material.

Step 5 Clean the cutter.

Step 6 Store the cutter in its proper place.

Wheels of Learning. Millwright Module 15101. Millwright Hand Tools. p. 19.

What's the best way for Rick to use the cutter?

*OPTION A

Rick checked the wire. He wanted to be sure he chose a cutter that was the right size. He chose a cutter. He looked at it to be sure the the cutting edges were not nicked or dull. He placed the cutter at the place he needed to cut. He squeezed the handles of the cutter. He cut the wire. He cleaned the cutter. Rick put it away.

OPTION B

Rick checked the wire. He wanted to be sure he chose a cutter that was the right size. He chose a cutter. He looked at it to be sure the the cutting edges were nicked and dull. He placed the cutter at the place he needed to cut. He squeezed the handles of the cutter. He cut the wire. He cleaned the cutter. Rick put it away.

OPTION C

Rick chose a cutter. He looked at it to be sure the the cutting edges were not too sharp. He checked the wire. He wanted to be sure he chose a cutter that was the right size. He placed the cutter at the place he needed to cut. He squeezed the handles of the cutter. He cut the wire. He cleaned the cutter. Rick put it away.